

## UNLOCKING LANGUAGE ACQUISITION: EVIDENCE-BASED STRATEGIES FROM COGNITIVE SCIENCE FOR ENHANCING RETENTION AND FLUENCY

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**Abstract:** *The field of language acquisition has experienced substantial progress thanks to the application of the principles of cognitive sciences, leading to the formulation of linguistic learning strategies based on evidence. These strategies are fundamental to improving acquisition, retention and mastery - the three dimensions of language learning pivots (Cook, 2016). The acquisition of language refers to the process by which individuals acquire a second language, encompassing various cognitive and emotional factors that influence learning results. Retention means the ability to remember and recover linguistic knowledge over time, while mastery concerns the ease and precision of the use of language in communication.*

**Key words:** *Cognitive science, language acquisition, retention, mastery, spaced repetition, retrieval practice, cognitive load, dual coding, implicit learning, vocabulary instruction*

The cognitive sciences, with regard to linguistic education, focuses on understanding the mental processes involved in language learning, including perception, memory and problem solving. In this context, several key concepts play an essential role in training effective language learning strategies. Among these are the distinction between implicit and explicit learning, the role of cognitive load and the importance of spaced repetition.

Implicit learning consists in acquiring unconsciously knowledge by exposure, while explicit learning implies conscious consciousness and understanding of linguistic rules and structures (Cook, 2016). Research suggests that the two forms of learning are vital; However, implicit learning often leads to more natural and common use, as it reflects the language acquisition processes. Techniques that promote implicit learning, such as immersive language experiences or task-based learning, can considerably improve learners' ability to internalize language models without the heavy cognitive load associated with the formal learning of the rules.

The theory of cognitive load stresses that learners have a limited information processing capacity. Effective language learning strategies must consider this limitation to avoid overwhelming learners, which can hinder retention and mastery. Techniques such as the information group in manageable units or the use of multimedia resources can reduce cognitive load, thus facilitating better acquisition and retention. In addition, the application of multimodal education, which combines visual, hearing and kinesthetic elements, has proven promising in improving the acquisition of the language by addressing various learning styles and preferences.

Another essential technique based on cognitive sciences that improves retention. This strategy is to review the material learned at strategic intervals to exploit the psychological spacing effect, which affirms that the information is more easily preserved when the study sessions are distributed over time rather than rushed into a single session. Learners employing rehearsals spaced in practices such as learning vocabulary via flashcards can undergo significant gains in terms of retention and recall (Cook, 2016).

In addition, the practice of recovery, in which learners are invited to recall information rather than simply re-explaining themselves with it, more solidifies language retention. Techniques such as self-test or recovery practice in significant contexts can promote deeper connections and facilitate mastery of language use. Cognitive science postulates that the act of recovery of information strengthens the neuronal ways and improves long-term retention.

In various learning environments, the implementation of these evidence-based strategies must also be adaptable to meet the different needs of learners. Factors such as the cultural context, age and individual learning preferences require a tailor-made approach to each educational framework. By integrating strategies based on evidence supported by the cognitive sciences, educators can create a more effective linguistic education which improves not only acquisition but also promotes retention and fluidity, meeting the various needs of learners in different contexts., Cognitive science plays a fundamental role in information on language learning strategies, since understanding cognitive processes can lead to the formulation of more effective teaching methods. The intricate relationship between cognitive functions, such as memory, attention and recovery processes, and language acquisition have attracted significant attention in the field of educational psychology. This understanding facilitates the development of pedagogical strategies that not only improve acquisition and retention, but also encourage fluidity in language students. In particular, research has shown that the principles derived from cognitive science can effectively integrate into various modalities of instruction, thus addressing the diverse needs of students in multiple contexts (Hajar and Karakus, 2025).

The key findings of cognitive research underline the importance of spaced repetition and recovery practice as powerful tools to promote long-term retention of new language information. The spaced repetition, a technique that implies reviewing material previously learned at strategically spaced intervals, exploits the effect of psychological

spacing, which improves the consolidation of memory (Cepeda et al., 2006). The research indicates that space the learning sessions in opposition to mass practice results in a better retention and recovery of vocabulary and grammar structures over time (Rediger and Butler, 2011). This method has broad applicability, with evidence that supports its use both in classroom configuration and autonomous language learning environments, which allows students to interact with the content of the language more effectively in different contexts.

In addition, the concept of recovery practice is also aligned with the cognitive theories that advocate active learning. Involving students in recovery not only solidifies their understanding, but also provides feedback on their mastery of language. For example, low -risk tests and self -assessment can significantly improve students' ability to remember vocabulary and phrases, ultimately contributing to fluidity (Nguyen et al., 2019). By integrating these strategies into language curricula, educators can promote a more interactive and student -centered approach, cultivating an environment where students are encouraged to actively commit to the language they are learning.

Another significant cognitive principle that informs effective language learning is the use of dual coding. This strategy, rooted in the cognitive theory of multimedia learning, postulates that combining verbal information with visual aid can improve understanding and retention (Mayer, 2001). For example, the use of images, diagrams and videos together with verbal explanations allows students to form mental associations that facilitate deeper understanding and fluidity. The research suggests that students who involve with double coding materials demonstrate better performance in language tasks than those who depend solely on text -based instruction (Lee and Kalyuga, 2017). This principle can be used effectively in various educational environments, including traditional classrooms, online courses and language immersion programs, thus attending to different learning preferences.

In addition, the theory of cognitive burden highlights the importance of managing cognitive resources during the learning process. Effective instruction should consider intrinsic, strange and twin cognitive loads that students experience. Language instructors can design lessons that optimize intrinsic load by introducing new concepts gradually and guaranteeing that the material is aligned with the existing knowledge bases of students (Sweller, 1988). Techniques such as fragmentation, where information is grouped into manageable units, allow students to process the content of the language more effectively. This is particularly relevant in mixed capacity classrooms, where students can have different levels of familiarity with the language taught.

In summary, by taking advantage of the ideas of cognitive science, educators can adopt evidence -based language learning strategies that significantly improve acquisition, retention and fluidity. The integration of spaced repetition, the practice of recovery, dual coding and the management of cognitive load in teaching practices not only align with cognitive principles, but also provides appropriate practical applications for a wide range of learning environments. These strategies are demonstrably effective in promoting a deeper

commitment and success between language students, which underlines the critical intersection of cognitive theory and educational practice in the domain of language instruction (Hajar and Karakus, 2025)., Vocabulary acquisition is essential for language mastery, which serves as a critical component in the development of communicative competence. The effective vocabulary instruction, therefore, requires a dual approach that covers direct and indirect learning strategies. Direct learning strategies imply an explicit instruction of vocabulary elements, including techniques such as teaching specific words and their meanings through definitions, examples and contextualized use. On the contrary, indirect learning strategies favor the most implicit methods, including exposure to language in the context through reading, listening and conversation in conversation. The evidence of cognitive science suggests that a combined approach, which integrates direct and indirect strategies, is essential to maximize vocabulary retention.

Direct instruction in vocabulary is often operationalized through techniques such as semantic mapping, words association and the use of mnemonic devices (Naeimi & Chow von Foo, 2015). These methods aim to deepen understanding and improve withdrawal by facilitating connections between the new vocabulary and existing knowledge structures. For example, semantic mapping visually represents relationships between words, helping students classify and contextualize vocabulary within broader issues or concepts. In addition, the use of mnemonic devices, which codify new information through association with family concepts or images, can significantly help memory retention. The theory of cognitive burden supports these methods by highlighting the importance of reducing strange cognitive demands, which allows students to focus on the assimilation of the new vocabulary (Sweller, 1988).

On the contrary, indirect vocabulary acquisition strategies emphasize the importance of exposure to language in authentic contexts. Techniques such as extensive reading and contextualized listening encourage the natural acquisition of vocabulary through repeated exposure in varied contexts. Research indicates that extensive reading not only increases the size of the vocabulary, but also facilitates incidental learning, providing opportunities for students to infer meanings through context (Elley, 1989). In addition, listening activities, including the use of podcasts, films and conversation practice, involve students with the phonological and morphological aspects of language, reinforcing vocabulary retention through auditory exposure. Cognitive science postulates that such "language contribution" is crucial, since it actively involves the cognitive processes of students in the mapping of sounds to meanings, thus strengthening the neural pathways associated with lexical recovery (Krahen, 1985).

In the classroom, using a combination of direct and indirect strategies allows educators to create an enriched language learning environment that foster vocabulary retention. For example, teachers can initiate lessons with directed vocabulary instruction using semantic mapping to establish a fundamental understanding before transition to

activities that promote language exposure, such as group discussions or shared reading activities. In addition, the integration of technology, such as language learning applications that use spaced repetition algorithms, supports an individualized approach for vocabulary acquisition, which meets different needs and learning steps (Sánchez & O'Rourke, 2015).

The implications of these findings extend to various educational environments, from traditional classrooms to digital learning environments. The flexibility of evidence-based strategies allows adaptation in various linguistic origins and student needs. For example, combined learning environments that combine in-person technology-mediated resources can ensure that a wider range of students have access to effective language learning methods and accommodates different learning styles and preferences (Graham, 2006).

Despite these promising ideas, the field of language acquisition remains mature for additional exploration. Future research ventures should focus on longitudinal studies to critically evaluate the effectiveness of various evidence-based strategies over time, especially as they interact with student-specific profiles and contexts. Moreover, as technology continues to evolve, investigate the influence of digital tools on the effectiveness of language learning remains a continuous concern that deserves academic scrutiny. Continuous refinement of these approaches will not only benefit educators, but will also improve the overall effectiveness of language instruction worldwide, ensuring that students can achieve desired language skills in an increasingly interconnected global landscape (Macaro, Graham & Woore, 2015).

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